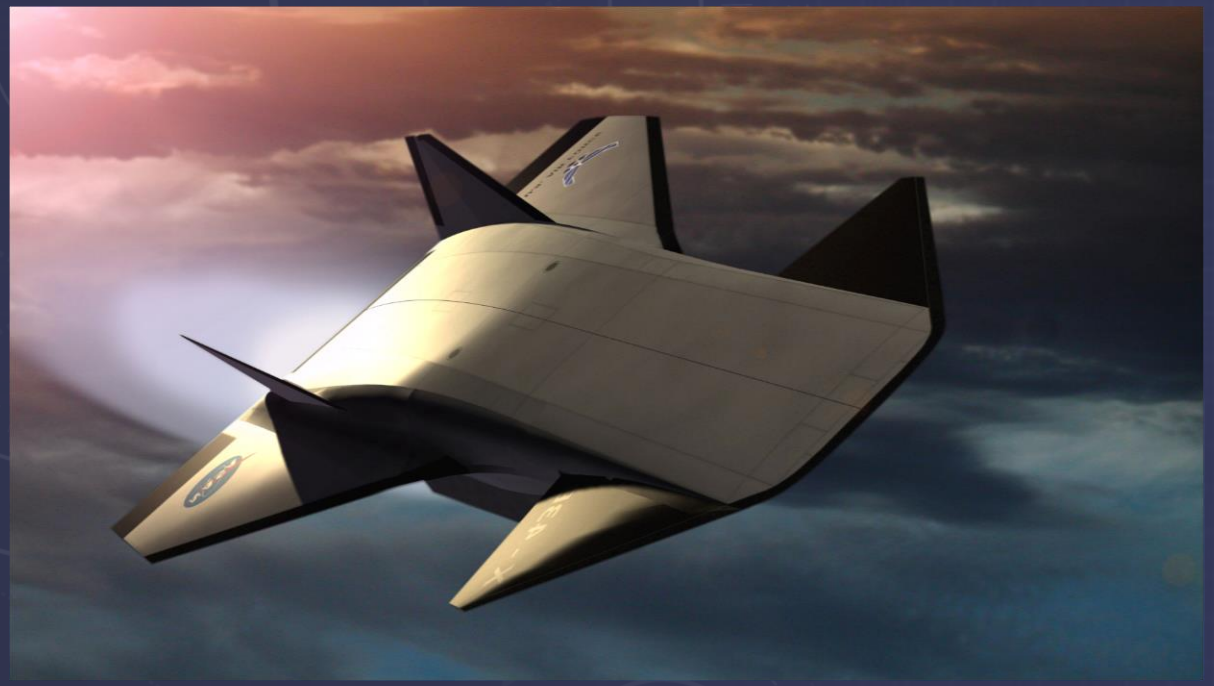
The Future of Transportation



Brandon Litherland, AST
NASA Langley Research Center
Aeronautics Systems Analysis Branch

The Big Questions

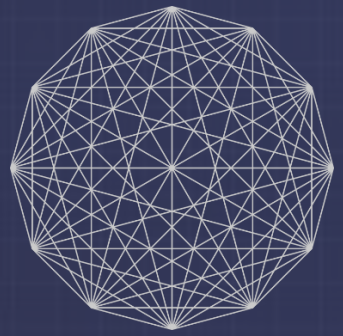
Where are we going?

How do we get there?

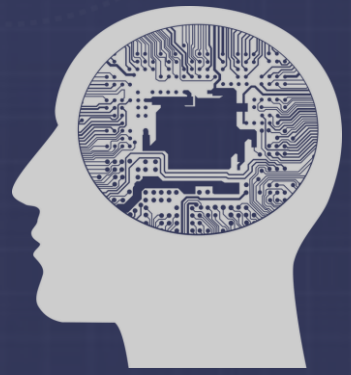
Are we there yet?

Where Are We Going?

Significant Population Growth



Much Higher Travel Density



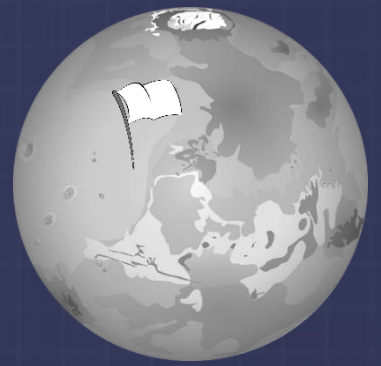
Artificial Intelligence

Autonomy

More Complex Goods Distribution

Increased Privatization

Plentiful Energy



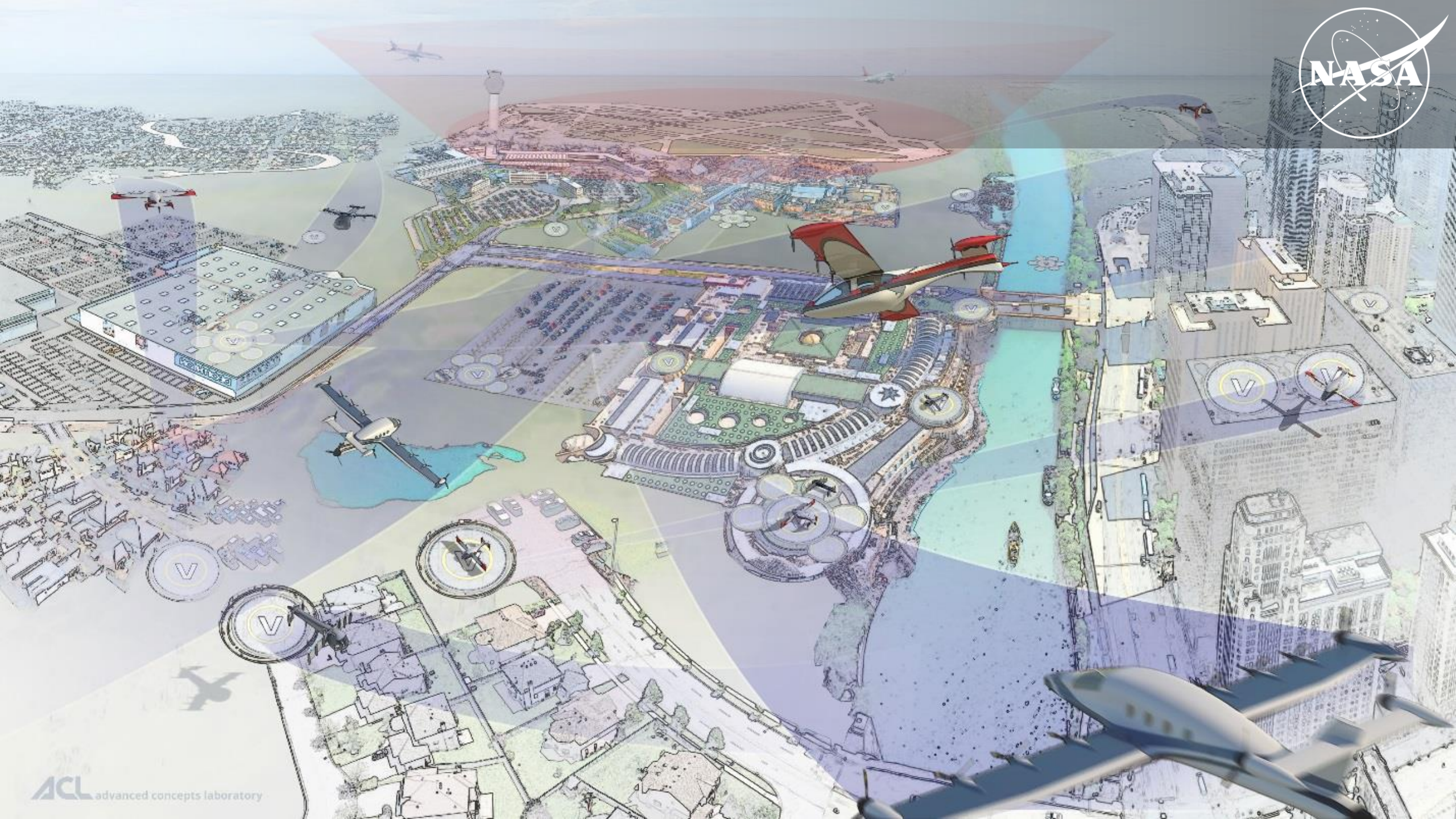
Extraterrestrial Colonization

Where Are We Going?

Where Are We Going?

Dense, Traffic-Restricted Cities

Dense, Traffic-Restricted Cities


NASA
ACL advanced concepts laboratory

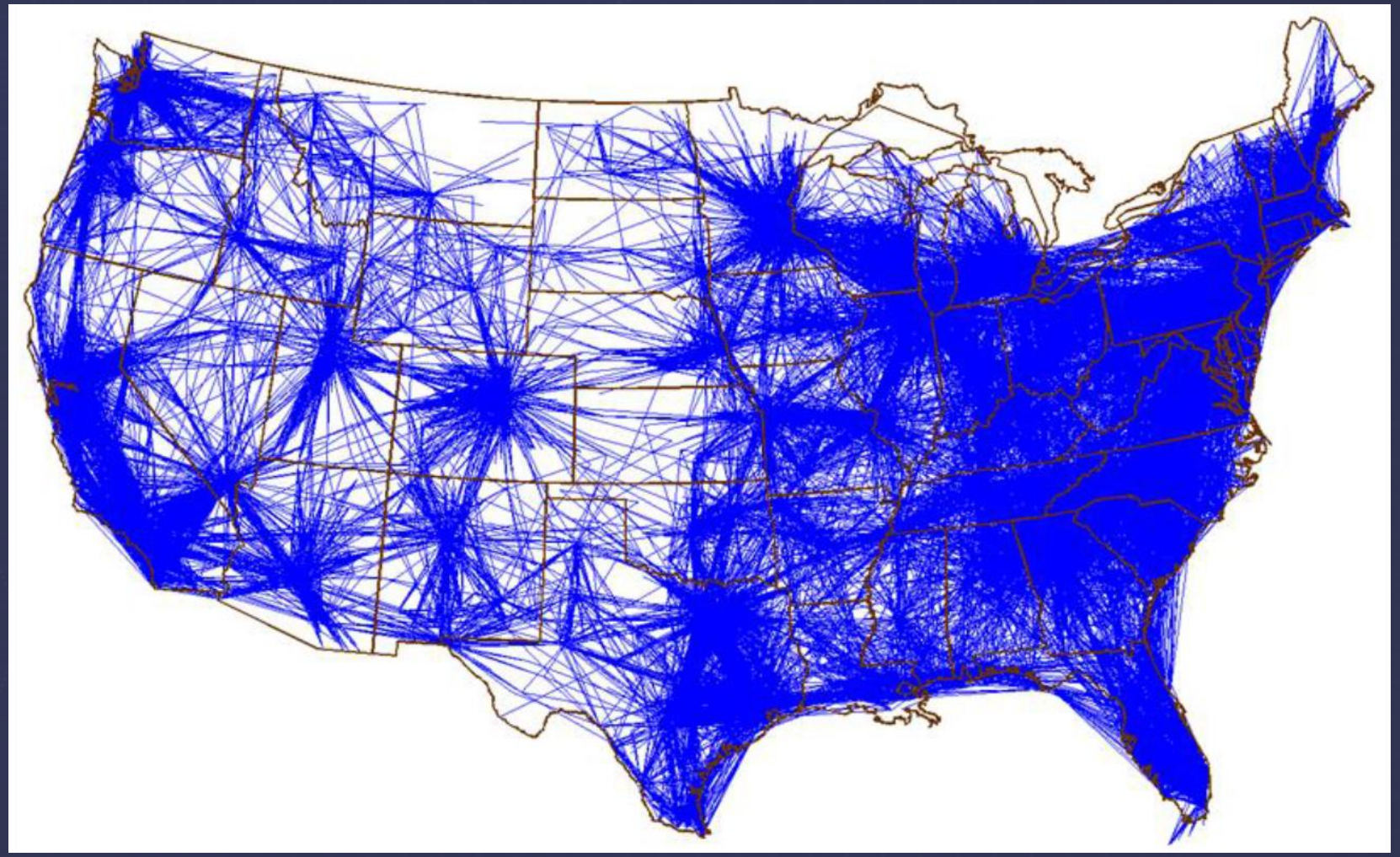
High-Speed Rail / Loop

Transportation Hubs

How Do We Get There?

On-Demand Flight Routes in 2035

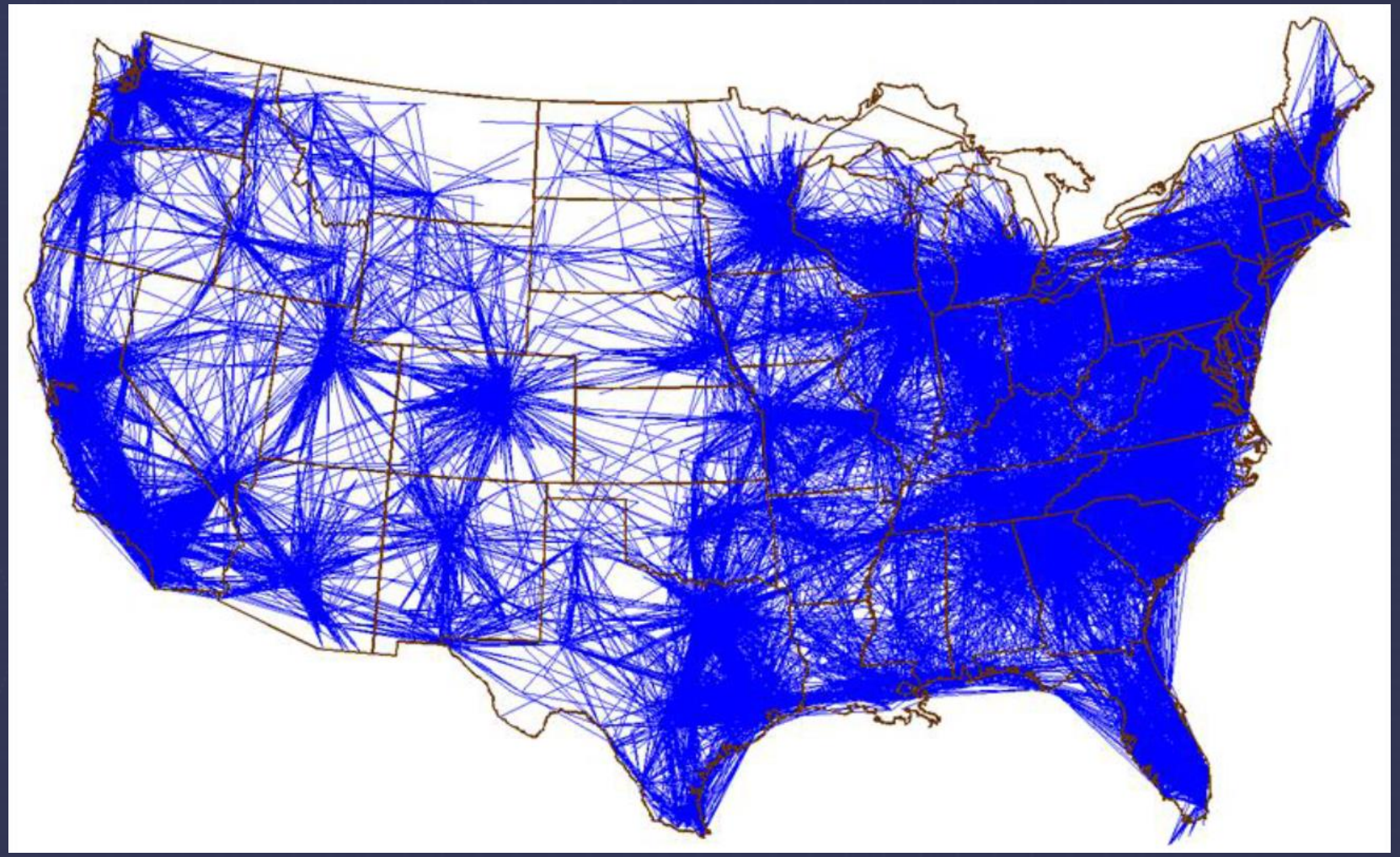
- Routes shown (~32,000) are only a quarter of the total predicted routes.
- This does not include commercial flights.



How Do We Get There?

On-Demand Flight Routes in 2035

- Necessitates advanced computing or artificial intelligence.
- Human oversight of network "health"



On-Demand Mobility

Video courtesy of Joby Aviation

Distant / Rural Communities

Off-Shore Communities

Supersonic Travel

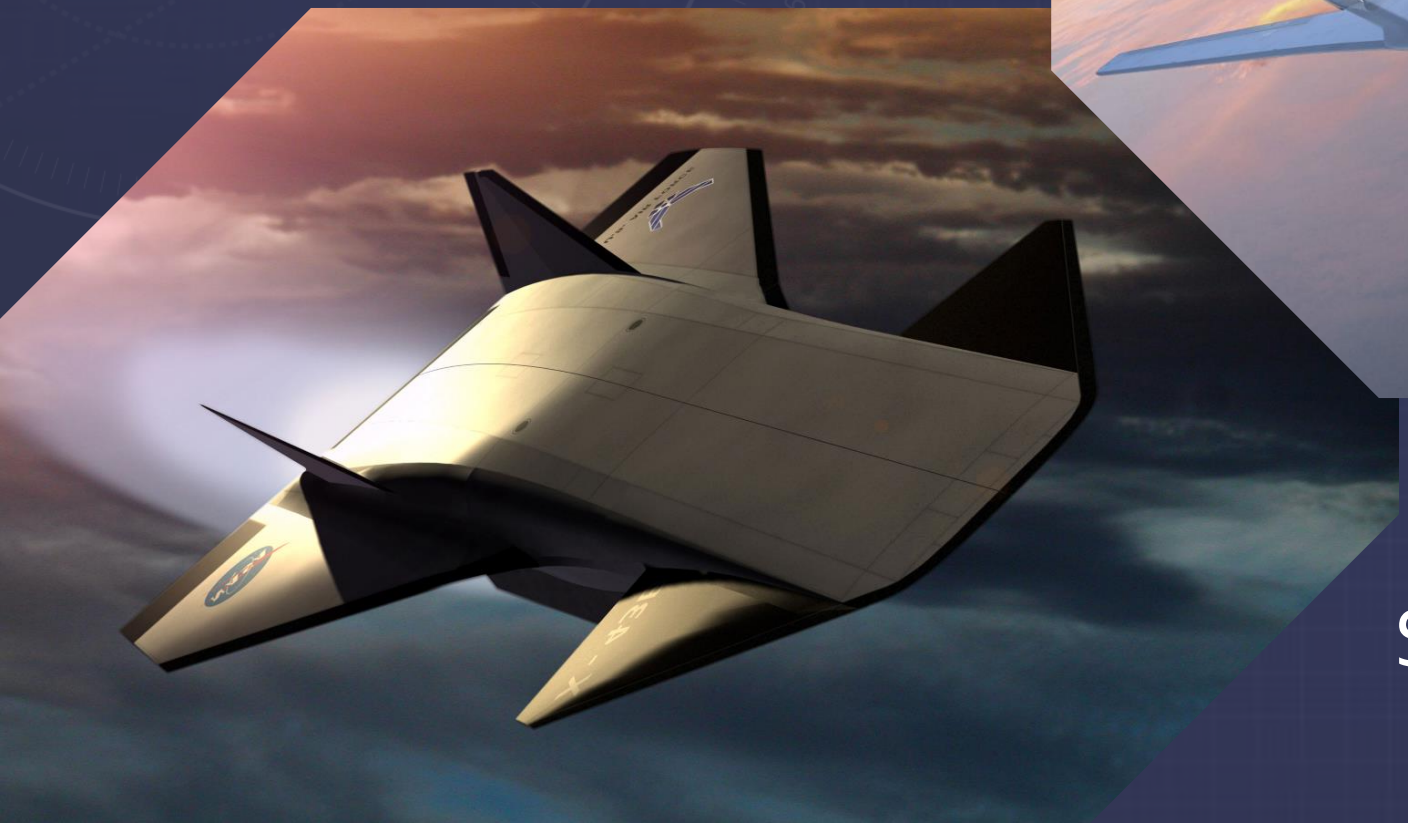
- Higher energy density storage
- Increased energy availability
- Lower sonic boom footprint of aircraft

➢ More powerful, affordable applications for the individual user

Supersonic flight becomes readily available for long distance travel over land.

Supersonic & Hypersonic Flight

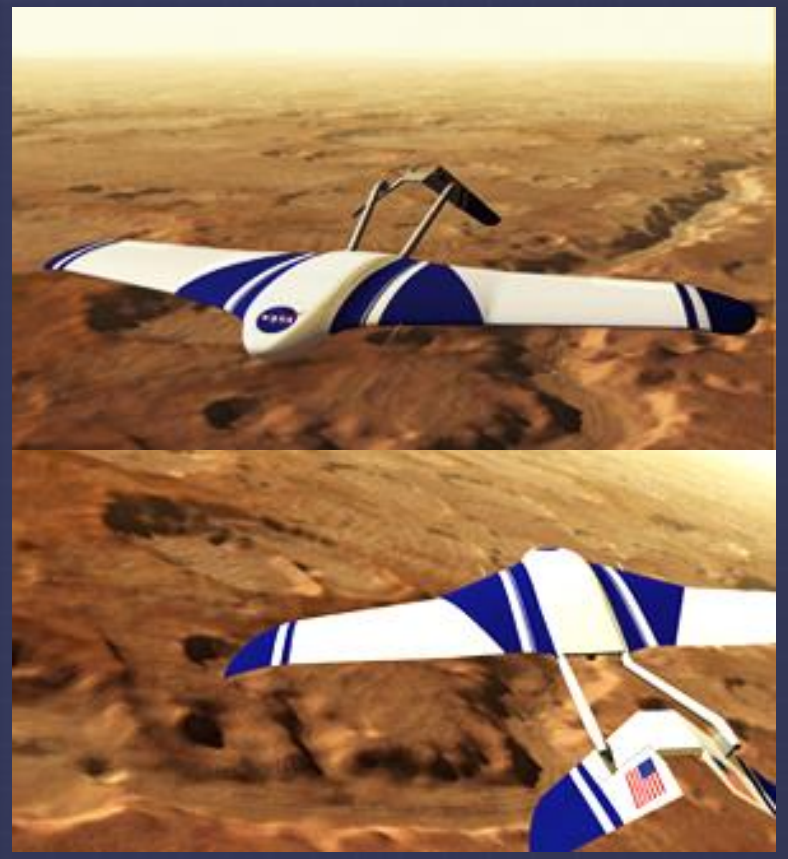
Rapid International Travel



Space Launch-Assist Vehicles

A New Home

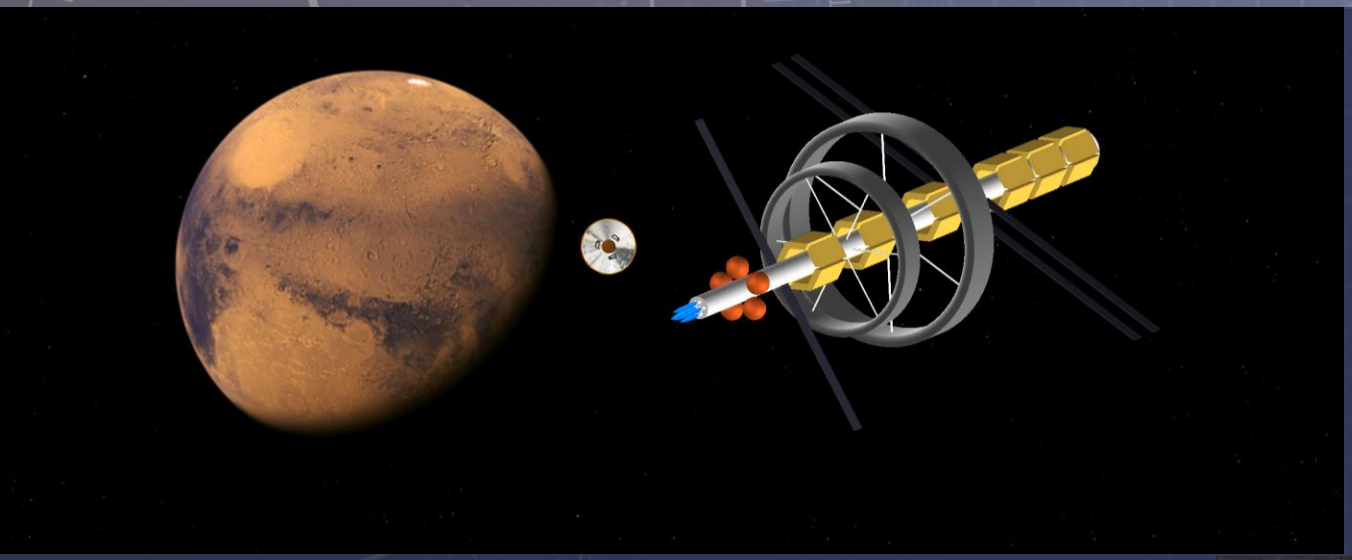
Extraterrestrial outposts and colonies



A New Home

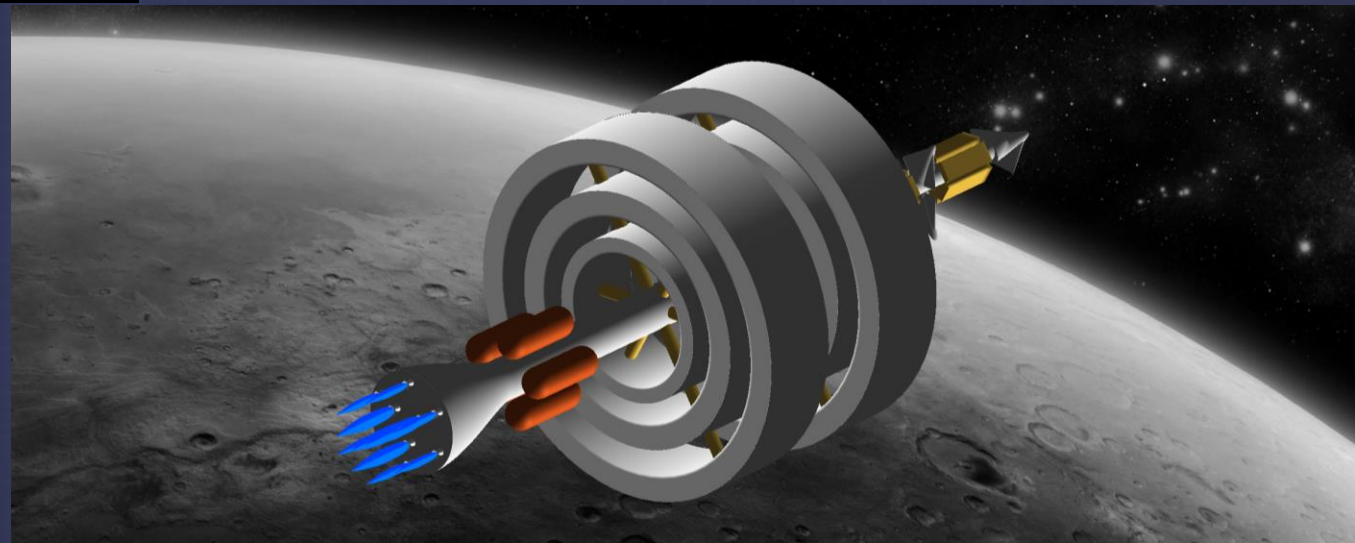
Commercial Space Transportation

A New Home



Routine
Transportation of
Goods and Personnel

Populated cruise ships
visiting the new exotic
destinations available.



Are We There Yet?

Distributed Propulsion

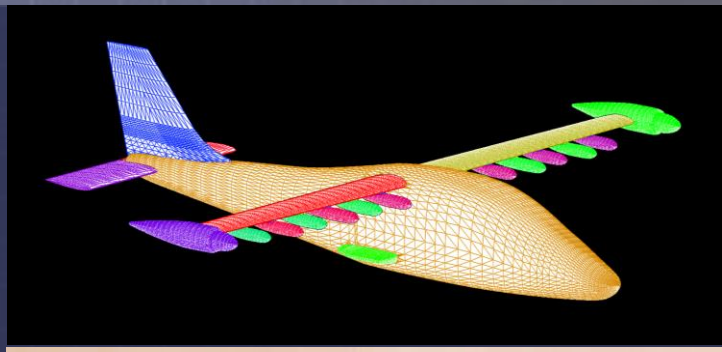
- X-57 Maxwell
- GL-10

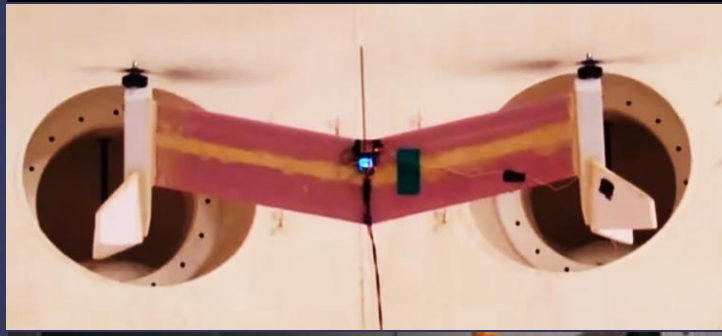
Fuels / Energy

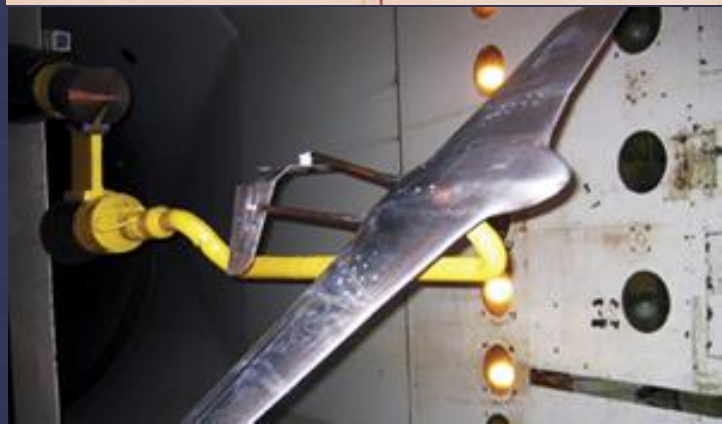
- FUELEAP (Fuel Cells)
- Fully-Electric Aircraft

3D Printing

- Structural Printing
- Carbon Fiber Printing
- Wood/Metal Pseudoplastic







Are We There Yet?

Safety and Reliability

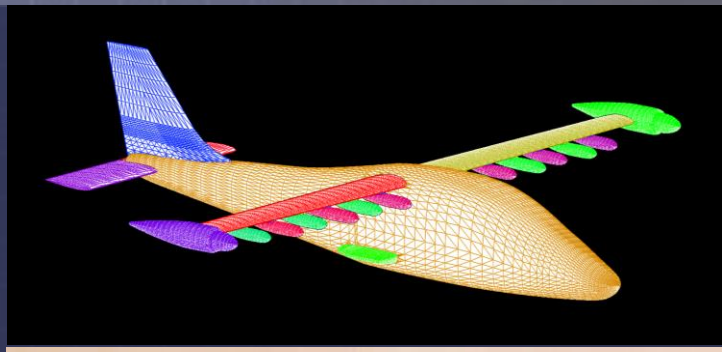
- Synthetic Vision
- Fault Tolerant Materials

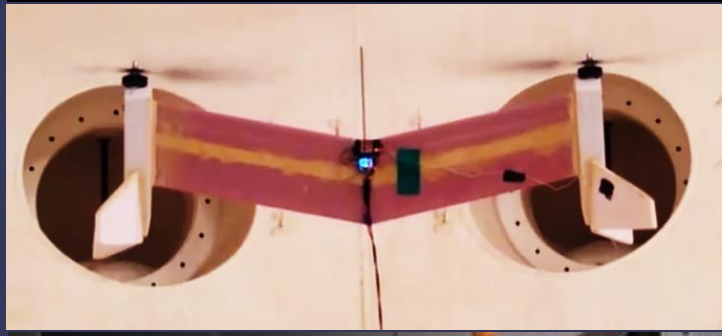
Autonomy / AI

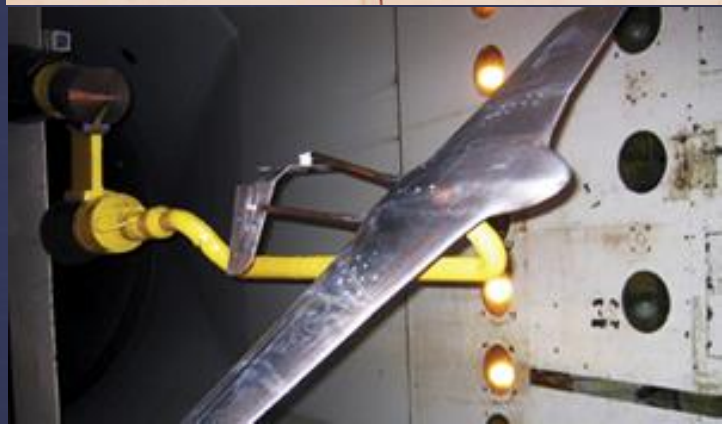
- Machine Learning
- Self-Driving Cars

Thin Atmos. Transport

- ARES
- Mars Reusable Flyer







NASA's Role

INNOVATE

EDUCATE

INSPIRE

OUR JOB IS TO BE JUSTIFIABLY DARING.

Hypersonic Vehicles

Advanced Materials

Safety and Reliability

Interstellar Exploration

Extraterrestrial Transportation